MA/CSSE 474 Homework #9 72 points

General hint: If it is very difficult to find a way to make the pumping theorem work for a given language that appears to be non-regular, consider the possibility that the language might actually be regular.

1. 8.8
2. (t-3-6) 8.8 de
3. (t-9) 8.9 This is a difficult problem. Begin thinking about it a few days before it is due.

Definitions of *maxstring* and *mix:* Examples 8.22 and 8.23.

4. (t-9) 8.10-a I.e., given a DFSM M = (K, Σ, δ, s, A) such that L(M)=L, construct a DFSM M*=(*K**, Σ, δ *, *s**, *A**) such that L(M*)=maxstring(L).
5. (t-6) 8.16a (this one is a little bit "logically tricky")
6. 8.16b
7. 8.21 (I like to put questions like these on exams)
8. (t-12) 8.21n (this is a nontrivial problem)
9. (t-3) 8.21o
10. 9.1 You can assume (and use without giving the details of the algorithms) any algorithms and decision procedures from chapter 9 or previous chapters.
11. (t-6) 9.1b See note below.
12. (t-6) 9.1d
13. (t-6) 9.1g. See note below.
14. (t-6) 9.1i

9.1g:
There is a small error in the statement of the problem. a* should be {a}*

9.1b:
Note that |L(M)| means "the number of elements in the language accepted by the machine M. Note that for some machines M, the language is countably infinite.

Previous questions and answers from Piazza:

General question: Is every Nonregular language countable in size? **A** Every language is countable (I.e. it is finite or countably infinite, because Σ is finite..

General question: Can we assume we know how to check if there are loops in a DFSM as the books assumes? **A** Yes. Unless a problem specifically states otherwise, for decision procedure problems, you may assume anything that is in an result in the book, the homework, or a class example or exercise.

Question on #8: I'm stuck on how to prove this one. Any particular rule I should be using,,,?

Hint 1: It's true. All of the credit is for showing that.

Hint 2: I am not sure how you could show this except by construction. I.e., describe how, given any non-regular language L, we can construct an infinite set T of regular languages, such that the intersection of all of the languages in T is exactly the set L.

Hint 3: The notion of "complement of a language" can be useful here.